REMARKS

This paper is responsive to the Non-Final Office Action dated March 19, 2010 wherein claims 12-30 were rejected. Claims 12-30 remain pending in this application. In view of the following remarks, Applicant requests further examination and reconsideration of the present patent application.

35 USC §103

In the Office Action, the Examiner rejected claims 12-30 under 35 USC 103(a) as unpatentable over Shih et al., U.S. Patent Application No. 2005/0152504 (hereinafter "Shih") in view of Liang et al., U.S. Patent No. 7,187,794 (hereinafter "Liang"). Applicant respectfully traverses this rejection.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 U.S.P.Q. 580 (C.C.P.A. 1974). However, it is not enough to show that all the elements exist in the prior art since a claimed invention composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). It is important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Id.* Specifically, there must be some articulated reasoning with a rational underpinning to support a conclusion of obviousness; a conclusory statement will not suffice. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Indeed, the factual inquiry determining whether to combine references must be thorough and searching, and it must be based on *objective evidence of record*. *In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002).

Additionally, it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. § 2145. Moreover, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); *see* M.P.E.P. § 2143.01(VI). If the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re*

Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); *see* M.P.E.P. § 2143.01(V).

Shih and Liang do not disclose features recited by independent claims 12, 21, 28, 29 and 30.

Independent claims 12, 21, 28, 29 and 30 recite, in general, similar language, *generating a variance map from measured projection data* acquired from a tomography system comprising: accessing the *measured projection data* from the tomography system, and formulating *a variance measure based upon the measured projection data* and generating *the variance map from the variance measure using a reconstruction algorithm*.

According to the Office Action, Shih teaches a method for generating a variance map from measured projection data acquired from a tomography system comprising: accessing the measure projection data from the tomography system (citing Shih: A tomography system 100 comprises an imaging system 102; citing FIG. 3 of Shih: acquires an object projection of an object 310); formulating a variance measure based upon the measured projection data (citing paragraph [0010] of Shih: generating the variance reconstruction from the variance projections) and generating a variance map from the variance measure using a reconstruction algorithm (citing paragraph [0043] of Shih: the variance projection includes an intensity map and positional data for the perspective that is common to the standard and object projections; note that 3D variance reconstruction of the variations between the object and the standard is generated, and the object is qualified based on the variance reconstruction). The Applicant respectfully disagrees.

As described on page 10, paragraph [0033] of the application, the current Application teaches "an efficient approach for processing measured data and for generating variance data from measured projection image data". Further, as recited in the independent claims **the measured projection data** is accessed from the tomography system and a variance measure based on **the measured projection data** is generated. On the contrary, Shih discloses a method of rapid automated inspection of manufactured objects that involves generating variance projections of the variations between the object and standard projections for particular perspectives (refer to Shih abstract). Clearly, generating variance projections of **the variations between the object and standard projections** for particular perspectives as taught by Shih does not supply the claimed recitation of generating variance measure based on **the measured projection data**.

Applicant respectfully notes that based on the cited passages and associated

observations in the Office Action, the Examiner apparently equates "generating variance projections of the variations between the object and standard projections" of Shih with the "generation of variance measure based on the measured projection data" as claimed in the current Application. Applicant respectfully submits that Shih fails to teach generation of variance measure based on the measured projection data as disclosed in the current Application. In fact, Shih clearly describes in paragraph [0035] and claim 1 that *the variance projection represents the difference between the object and stored standard projections*. Further, by *variance projection*, Shih clearly means differences between the object and the stored standards that will create corresponding features in an intensity map (refer to Shih, page 10 paragraph [0035]). On the contrary, the *variance measure*, as described in Applicant's Specification, paragraph [0034] and FIG. 4, is solely based on the object, computed on a pixel-by-pixel basis and refers to measures of variation within various regions of pixels. Therefore, the disclosure of "generating variance projections of the variations between the object and standard projections" of Shih may not be scientifically and meaningfully equated with the claim element "generation of variance measure based on the measured projection data" of the current Application. Thus, Shih fails to teach or suggest or disclose all elements of independent claims 12, 21, 28, 29 and 30. Accordingly, Applicants respectfully request withdrawal of the Section 103 rejection of independent claims 12, 21, 28, 29 and 30, and further requests allowance of independent claims 12, 21, 28, 29 and 30, as well as all claims depending therefrom.

Further, the Office Action concedes that Shih fails to teach or suggest or disclose generating a variance map from the variance measure using a reconstruction algorithm. The Examiner relied upon Liang to obviate the deficiencies of Shih. According to the Office Action, it would have been obvious to one of ordinary skill in the art to generate the variance map from the projection data as taught by Man et al since one would have been motivated to make such modification to reduce artifact thus improving image quality. (Office Action, page 3, last 5 sentences of first paragraph). According to the context of the present Office Action, Applicant assumes that the Office Action meant projection data as taught by Liang, and not Man et al, and the Applicant has proceeded with the rejection accordingly.

Applicant respectfully states that although Liang discusses *generating a curve for variance and means*, it fails to teach or suggest or disclose the cited claim element of *generating a variance map from the variance measure using a reconstruction algorithm.* Applicant respectfully notes that based on the cited passages and associated observations in the Office Action, the Examiner apparently equates "generating a curve for variances" of Liang with the "*generating a variance map from the variance measure using a reconstruction*

algorithm" as claimed in the current Application. First, the entirety of the Liang reference appears to detail a method for treating noise in low-dose computed tomography projections and reconstructed images. The method includes acquiring raw data at a low mA value, applying a domain specific filter in a sinogram domain of the raw data, and applying an edge preserving smoothing filter in an image domain of the raw data after filtering in the sinogram domain. In that context Liang merely discloses generating a curve for variance and mean values given a set of raw data, fitting the curve by a functional form, and determining, for a fitted curve, a transformed space having substantially constant variance for all mean values. The method further includes applying a domain specific filter in a sinogram domain of the set of raw data, and applying an EPS filter in an image domain of the set of raw data after filtering in the sinogram domain. (*See* Abstract Figure 5, Figure 9, Liang). Nowhere does Liang teach or suggest or disclose anything akin to *generating a variance map from the variance measure using a reconstruction algorithm*. Further, Liang does not even mention the word "map" or anything akin to that. The Applicant respectfully emphasizes that the claim element "variance map", as used in the current Application, is very specifically described as a diagrammatical representation designed to visualize the regions of an image having similar variance due, for example, to one or more features or high density objects in the image. *See* page 10, paragraph 34, lines 1-14. Therefore, and it may not be scientifically correct to equate a "variance map" with a generic term such as a "curve for variances". Thus, Liang fails to teach or suggest or disclose all elements of independent claims 12, 21, 28, 29 and 30. Accordingly, Applicants respectfully request withdrawal of the Section 103 rejection of independent claims 12, 21, 28, 29 and 30, and further requests allowance of independent claims 12, 21, 28, 29 and 30, as well as all claims depending therefrom.

Secondly, even if, *arguendo*, the curve for variances of Liang could be combined with the system of Shih, the combination would teach away from the current Application. Liang discloses "a noise treatment method for low-dose CT comprises filtering in sinogram domain and smoothing in image domain. Instead of using traditional filtering that can cause blurring and artifacts, the projection sinograms are treated by a scaled transformation, Wiener filtering, and a Karhunen-Loeve (K-L) domain penalized weighted least square (PWLS) smoothing, which is based on the nonlinear noise property or "ground truth" of the low-dose CT projections acquired from experimentation." (Liang, Summary of invention). As shown in Fig. 4A and described in column 8 lines 13-20 of Liang, "The probability distribution of the calibrated data form channel 600 is shown in FIG. 4A with comparison to corresponding Poisson, Gamma and Gaussian probability distribution functions (PDF). **It can be clearly seen that the noise distribution of the projection data has an approximated Gaussian functional, instead of usually**

assumed Poisson distribution."

On the contrary, as disclosed in paragraph [0040], page 12 of current Application, "In accordance with the present technique, the **variance measure is formulated or computed by replacing the measured projection data by an estimate of the signal variance**. In case of X-ray CT, **the estimate of the signal variance is determined by assuming that the measured projection data are Poisson random variables**. In case of high count rate CT, the estimate of the signal variance is determined by assuming that the measured projection data is normally distributed with a standard deviation equal to the square root of the mean."

In the current Application signal variance is determined by assuming that the measured projection data are Poisson random variables and the Liang teaches that noise distribution of the projection data has an approximated Gaussian functional, instead of usually assumed Poisson distribution. Thereby, Applicants respectfully submit one skilled in the art would not be motivated to combine the teachings of Shih with those of Liang to obtain the recited claims as Liang teaches away from the teachings of the current Application.

Thus, Shih and Liang, taken alone or in hypothetical combination, fail to teach or suggest all elements of independent claims 12, 21, 28, 29 and 30. Accordingly, Applicants respectfully request withdrawal of the Section 103 rejection of independent claims 12, 21, 28, 29 and 30, and further requests allowance of independent claims 12, 21, 28, 29 and 30, as well as all claims depending therefrom.

Applicant further submits that the claims 13-20, depend directly or indirectly from independent claim 12, and accordingly, these claims are allowable under 35 USC 103 by their dependency. Further, claims 22-27, depend directly or indirectly from independent claim 21, and accordingly, these claims are allowable under 35 USC 103 by their dependency.

Summary

For the reasons set out above, Applicant respectfully submits that the application is in condition for allowance. Favorable reconsideration and allowance of the application are, therefore, respectfully requested.

If the Examiner believes that anything further is necessary to place the application in better condition for allowance, the Examiner is kindly asked to contact Applicant's undersigned representative at the telephone number below.

Respectfully submitted,

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